PEACE/WILLISTON
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Williston Watershed Aerial Kokanee (Oncorhynchus Nerka) Spawning Survey 1990

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ABSTRACT

An aerial survey for spawning kokanee was undertaken between October 16, 1990 to November 1, 1990 on selected Williston Reservoir tributaries. Key sections of eighteen selected rivers (totaling 1303 km) were surveyed during the investigation. Kokanee (approx. 10,300) were only found in the Finlay River. The kokanee holding in the Finlay River tended to be located in side channel pools with no flow and a depth of 1-2 m. No kokanee were observed spawning, however, test redds were present and limited digging behaviour was observed. The cooler weather may have delayed the maturation process, thereby off-setting spawning timing, until sometime after the survey was completed (after ice-up).

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1.0 INTRODUCTION

Williston Reservoir is the largest body of fresh water in British Columbia. It was formed in 1968 by the completion of B.C. Hydro's W.A.C. Bennett Dam on the Peace River.

Kokanee, a landlocked sockeye salmon, provide public angling opportunities and are forage for other fish species. Their numbers within the reservoir have apparently increased between 1975 and 1988, but they are not present in sufficient numbers to provide a sport fishery. The Williston Lake Fisheries Compensation Program Management Plan states that: kokanee will play a central role in Williston Reservoir fisheries.

Kokanee were captured in all three reaches of Williston Reservoir during the 1988 gillnetting studies. Native populations are present in both Arctic (head waters of the Parsnip R.) and Thutade Lakes (head waters of the Finlay R.). Historically, reports by early explorers indicated "silver salmon" in the Finlay River (R.M. Patterson, 1968). During recent years there have been unconfirmed reports of kokanee in the Clearwater, Cut thumb, Parsnip, Nation, Ospika, Finlay and Akie Rivers.

A kokanee spawning survey was conducted in the lower 60 km of the Finlay River between October 10-13, 1989 by the Williston Fisheries Compensation Program. The survey found 3000-6000 adult kokanee in sloughs and side channels of the main river.

Prior to the current study, spawning activity had only been observed in the Finlay River. As a result of this, an aerial survey was undertaken in 1990. Key sections of eighteen selected rivers (totalling approx. 1303 km) draining into the Williston Reservoir were surveyed from October 16, 1990 to November 1, 1990. The primary objectives of the survey were to:

1. Determine the timing and distribution of spawning kokanee.

2. Estimate the numbers of kokanee spawning.

3. Determine the type of habitat utilized by spawning kokanee.

2.0 METHODS

Key sections of eighteen selected rivers (totalling approx. 1303 km) draining into the Williston Reservoir were surveyed from October 16, 1990 to November 1, 1990 (Fig. 1 ; Table 1). Each river was surveyed by helicopter in an upstream or downstream direction at tree top level, between 25 and 30 mph. Three observers participated in each survey. If kokanee were observed, their locations were recorded using the latitude/longitude co-ordinates from the helicopter's loran and geographical landmarks (if possible). A spawning survey data sheet was completed for each river (See Appendix 1).

Rivers surveyed for kokanee met one or more of the following criteria:

- large and stable;
- reliable sources indicated kokanee or potential kokanee spawning habitat present;
- kokanee documented in head water lake;
- net-work of side channels present, (kokanee were observed in side channels on the Finlay River in the fall of 1989).

Note: The Davis and Mesilinka Rivers were surveyed in order to help confirm the absence of wild kokanee, as kokanee may be stocked in these systems in the future.

Visibility

For the purposes of this survey, visibility is a measure of water visibility. Example- good visibility generally indicated nothing obstructed visibility to river bottom.

With the exception of the Akie, Ospika, Pack and Finlay Rivers (Nov. 7), visibility was generally good.

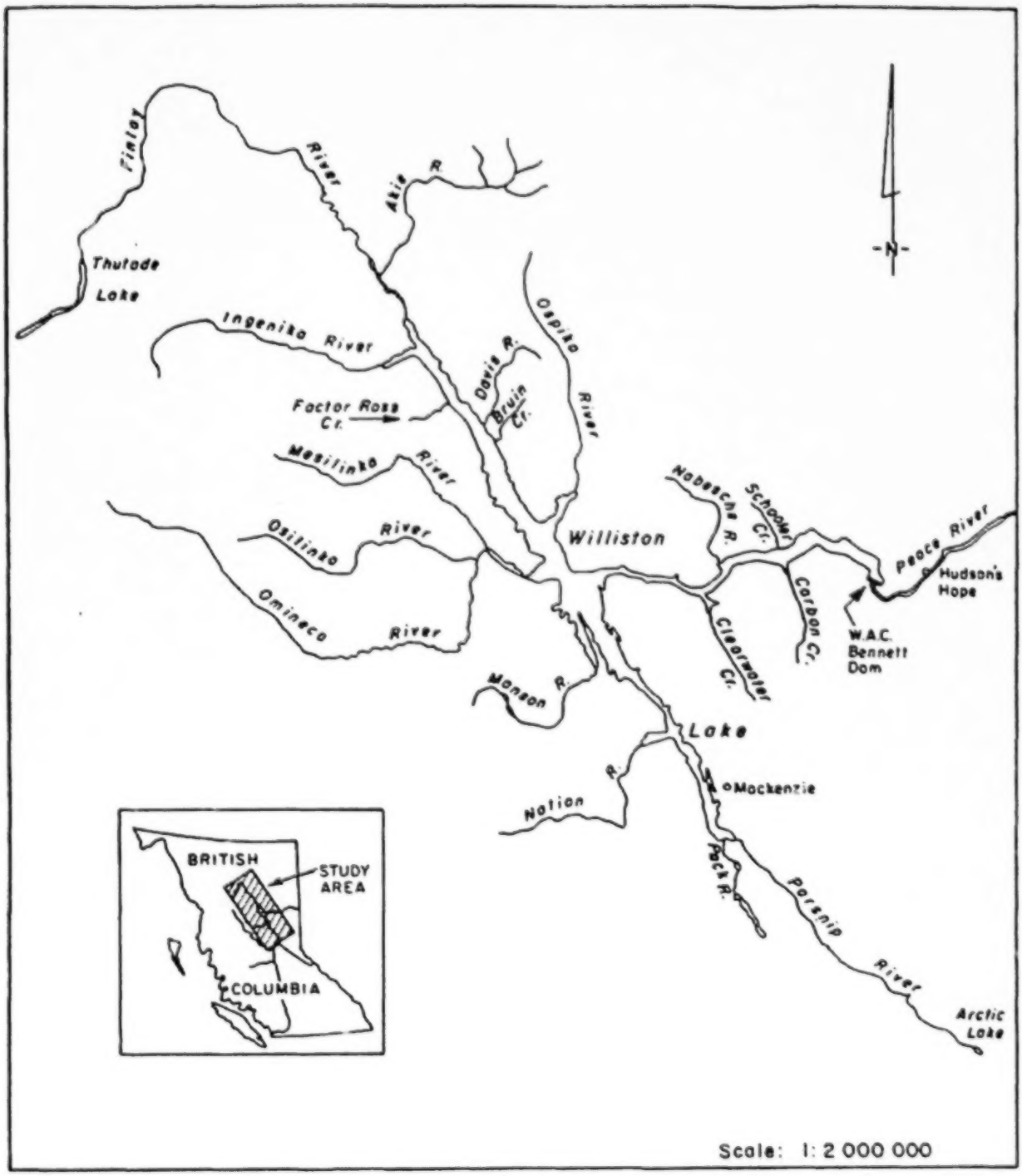


Figure 1 Study area location - Williston Lake.

TABLE 1 RIVERS SURVEYED

DATE	RIVER SURVEYED	RIVER(KM) LENGTH	*LENGTH(KM) SURVEYED	VISIBILITY	#KOKANEE OBSERVED	COMMENTS
OCT. 16	PARSNIP	175	89	GOOD	0	
OCT. 16	NATION	126	45	GOOD	0	
OCT. 16	MANSON	83	60	GOOD	0	
OCT. 16	OSILINKA	114	66	GOOD	0	
OCT. 16	OMINECA	219	4	GOOD	0	
OCT. 17	FINLAY	278	97	GOOD	5100	(1)
OCT. 17	AKIE	90	25	POOR	0	
OCT. 17	INGENIKA	119	15	GOOD	0	
OCT. 19	OSPIKA	111	49	POOR	0	
OCT. 19	DAVIS	54	54	GOOD	0	
OCT. 19	BRUIN	26	19	GOOD	0	
OCT. 19	MESILINKA	144	62	GOOD	0	(2)
OCT. 23	CLEARWATER	50	50	GOOD	0	(3)
OCT. 23	NABESCHE	50	6	GOOD	0	(4)
OCT. 23	SCHOOLER	27	13	GOOD	0	
OCT. 23	CARBON	46	46	GOOD	0	
OCT. 24	PARSNIP	175	175	GOOD	0	(5)
OCT. 24	PACK	12	12	POOR	0	
OCT. 25	FACTOR R.	17	6	GOOD	0	
OCT. 25	FINLAY	278	170	GOOD	8200	(1)
NOV. 1	FINLAY	278	278	POOR	3000	(1)
TOTAL		2,472	1,303			

(1) Kokanee in very tight schools.

(2) Schools of whitefish present, up to 45/school.

(3) Spawning habitat in upper Clearwater R. only.

(4) Surveyed to falls approximately 6 km.

(5) Limited spawning potential in mainstem upstream of Anzac C.

* from river mouth

3.0 RESULTS

Weather

Air temperatures during the study were generally cooler than the temperatures recorded at Ingenika Point over the 20 year standard time period 1961 to 1980 (Atmospheric Environment Service) (Table 2). Mean air temperatures from October 13 to 31, 1990 averaged 2.5°C. below the 20 year average for the month of October, while air temperatures from November 1 to 7, 1990 averaged 7.0°C below the 20 year average. (Fielden 1991; Table 3).

Table 2

Adjusted Average Total Monthly Precipitation and Mean Daily Air Temperatures at Ingenika Point.

	Temperature (C)			
Month	Mean Maximum	Mean Minimum	Mean	Precip. (mm)
Sept.	13.8	3.5	8,6	41.5
Oct.	7.1	-1.2	3.0	34.8
Nov.	-2.2	-5.8	-2.3	37.2
Dec.	-10.0	-18. 2	-14. 1	64.6
Jan.	-12.9	-22.7	-17.8	47.5

20 year standard time period 1961 to 1980 (Atmospheric Environment Service).

Table 3

Mean Monthly Air Temperatures - Lower Finlay River 1990

	Temperature (C)		
Month	Mean Maximum	Mean Minimum	Mean
Oct.	3.8	-2.3	0.5
Nov.	-3.4	-11.9	-9.3

The temperature data represents the data collected October 13 to November 7, 1990, at the lower Finlay River (Fielden 1991).

Kokanee Distribution and Timing

Approximately 10,300 kokanee were observed at 8 locations in side channels and the main stem of the Finlay River during the 1990 investigation (Table 1; Figure 1). The kokanee holding in the Finlay River tended to be located in side channel pools with no flow and a depth of 1-2 m (Table 4). No kokanee were observed spawning, however, test redds were present and limited digging behaviour was observed at Location # 1.

Table 4

Finlay River
Kokanee Timing and Distribution - 1991

Map Loc.#	Date	Habitat Type	# of Kokanee	UTM
1	* Oct. 17	Side channel	3000	10.3685.63282
2	Oct. 17	Side channel	2000	10.3665. 63306
3	Oct. 17	Side channel	100	10. 3639. 63371
3	Oct. 25	Side channel	500	10.3639. 63371
4	Oct. 25	Mainstem	1000	10. 3436. 63670
5	Oct. 25	Slough	700	10.3391. 63683
6	Oct. 25	Mainstem	3000	10.6473.63755
1	* Oct. 25	Side channel	3000	10. 3685. 63282
1	* Nov. 1	Side channel	3000	10.3685.63282

* Same groups of kokanee suspected

Location #1

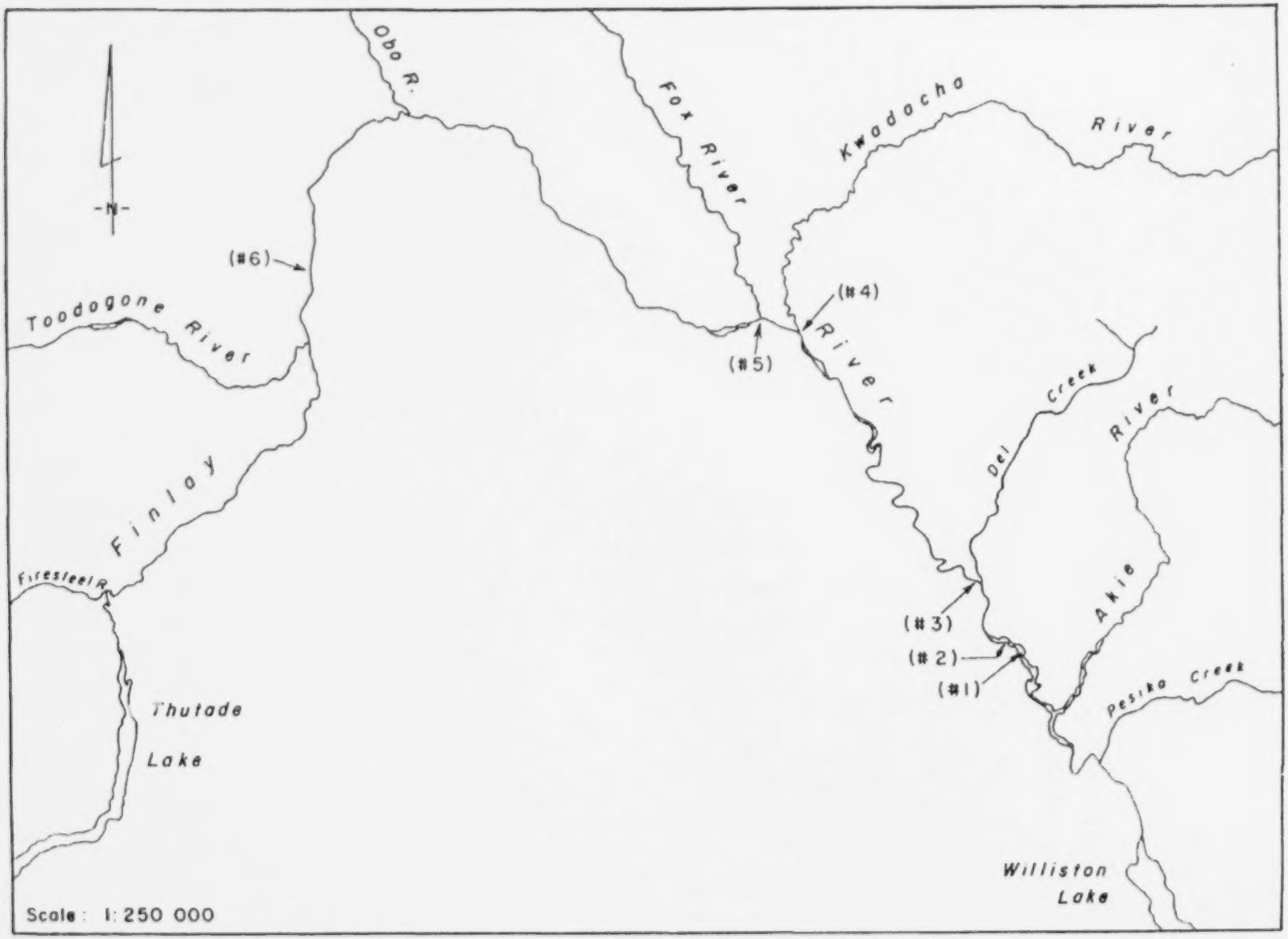
Located ~32 km upstream from the mouth, this side channel (no flow) pool had an approximate depth and visibility of 0.7 m. Test redds were present at this site.
Kokanee holding.

Location #2

Located ~38 km upstream from the mouth, this side channel (no flow) pool had an approximate depth and visibility of 1.2 m.
Kokanee holding.

Location #3

This side channel pool was located ~54 km from the mouth (near Del C).
Kokanee holding.



Kokanee locations (#1-6)

Figure 2 Finlay River.

Location #4

Located ~93 km from the mouth (near Kwadacha R), this main stem glide had an approximate depth and visibility of 2.0 m. Kokanee migrating.

Location #5

Located ~97 km from the mouth (near Fox Creek), this side channel pool had an approximate depth and visibility of 2.0 m. Kokanee holding.

Location #6

Located ~170 km from the mouth (near Fishing Lakes), this main stem glide had an approximate depth and visibility of 1.5 m, Kokanee migrating/holding.

4.0 DISCUSSIONS

Aquatic Resources was commissioned by the Ministry of Environment to conducted a kokanee spawning survey in the lower Finlay River between October 10, 1990 and November 7, 1990. Their survey indicated that slough and back channel habitat were the only areas where concentrations of kokanee (approx. 6,573) were observed in the lower Finlay River. It was also indicated that the gravel in many of these areas did not appear to be as suitable for spawning (high fines content) as the gravel in the mainstem glides.

It appears that the only concentrations of kokanee were in the Finlay River. Rough calculations using 1988 gill netting data (Blackman 1992) and hydroacoustic data (Johnson and Yesak, 1989) suggests that there should be significantly more spawners than were observed.

The selectiveness of the stock to the Finlay River suggests that the Williston stock of kokanee may have originated from Thutade Lake, located at the headwaters of the Finlay River. Initially it was assumed that the Williston kokanee had originated from the Arctic Lake stocks at the headwaters of the Parsnip River. There have been reports of kokanee in the Parsnip River and some have been captured in Tudyah Lake (tributary to the Parsnip reach). If there are kokanee utilizing the Parsnip System, the run timing must be different as no fish were observed in the river during the survey period.

Only the lower 60 km of the Mesilinka and Ospika Rivers were surveyed, however these areas had more than adequate kokanee spawning habitat. It is therefore doubtful kokanee were present in the upper reaches of the two rivers.

Visibility was poor in the Akie and Ospika Rivers due to the glacial nature of the systems. Visibility was also poor in the Pack River due to the dark coloration of the water. It is therefore feasible that kokanee may have been present, but not observed in these systems.

The Kwadacha River (tributary of the Finlay River) is a glacial system which was not surveyed during the 1990 investigation. However, unconfirmed reports, indicating the presence of kokanee, were received after the 1990 investigation was completed.

Surveys of the Ominica and Ingenika Rivers were curtailed due to darkness and weather conditions. Insufficient habitat was checked to speculate as to the presence or absence of kokanee.

Local sources had indicated the presence of kokanee in Clearwater, Nation and Cut thumb Rivers. However, time constraints, or the possibility their spawning timing may not have coincided with the investigation are all possible reasons that none were observed. This combined with the immense size of the watershed made it difficult to cover all potential kokanee systems.

The cooler weather may have offset spawning times, until sometime after the survey was complete (after ice-up). The warmer water temperatures in the side channels (up to 5 oC warmer than mainstem) and the instability of the main stem may have prompted spawning in slough and back-channels. Numerous investigations (Lister et al, 1980; King and Young, 1986;1986b; Bonnel, 1990; and Sheng et al, 1990) have found that ground water fed side channels are more productive and have higher egg to fry survival rates than mainstem areas. The timing of spawning in ground water fed side-channels is often later than stocks that spawn in the main river because of warmer sub-gravel temperatures.

5.0 RECOMMENDATIONS

The potential importance to the fisheries of the watershed and the level of enhancement activities that may be directed towards this species makes it important to gather biological background data.

A radio tagging program could be used to determine spawning timing and distribution of kokanee in the Finlay River. Once the kokanee are located, scuba divers could be used to examine their condition.

A public information campaign could also be initiated to gather additional information on timing and distribution.

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APPENDICIES

APPENDIX 1

Spawning Survey Form

KOKANEE SPAWNING SURVEY '90

Date: River: Crew:

SITE	HLD/SP	T	D	V	MORTS	LIVE	COMMENTS

RIVER - Name of river studied.

SITE - Main or side-channel.

HLD/SP - Holding, spawning, or migrating.

T - Type of habitat being utilized (Pool, riffle, run , glide).

D (m) - Water depth the Kokanee are in.

V (m) - Water depth visibility.

MORTS - Number of dead Kokanee.

LIVE - Number of live Kokanee.

COMMENTS -